USDA
Forest Service
Forest Health Protection

Blue Mountains
Forest Insect and Disease
Service Center

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File Code: 3400 **Date:** 9 April 2021

Subject: Five Points planning area disease report

To: District Ranger, La Grande Ranger District, Wallowa-Whitman NF
Portions of T1S, R38E, sec 31; T2S, R38E, sec 6; T2S, R37E

This report discusses disease conditions and recommendations for management units proposed in the Five Points management area. I conducted reconnaissance with Lucas Glick, district silviculturist, on 18-20 August 2020. We observed and discussed stand composition and stocking, diseases present, and management options. The intent of management in this area is to reduce stocking, increase early seral species representation, and increase the health of stands by making them more resistant and resilient to disturbances. The intent is also to reduce fuels and make changes that would moderate fire behavior should wildfire occur in these stands.

Summary of Observations

-Many stands are overstocked, often with a significant component of grand fir. Reducing stocking and favoring early seral ponderosa pine and western larch would make the stands more resilient to disturbance. Grand fir is very susceptible to several root diseases, a stem decay, a bark beetle, and is likely to be defoliated by insects should an outbreak occur.

-Dwarf mistletoe is common in the western larch. Favoring lightly infected or un-infected larch in thinning treatments would help reduce the impact of this disease, and reduce the prevalence of this parasite into the future.

-Heterobasidion root disease is common in the moister forest types. Grand fir is the most susceptible species, and reducing stocking of grand fir would help limit mortality and growth loss caused by this disease.

-Laminated root rot was found in several stands adjacent to currently proposed management stands. This root disease can cause unstocked areas (root disease centers), and grand fir and Douglas-fir are the most commonly infected species. Identification of disease foci, and reforestation with the resistant early seral ponderosa and larch, are the most effective ways to limit losses to this disease.

-Douglas-fir dwarf mistletoe was moderate to severe in some stands in the western management area. Sufficient stocking of ponderosa pine exists to allow removal of the Douglas-fir, and would eliminate impact from this disease. Douglas-fir dwarf mistletoe often forms large brooms that can act as fuel ladders.

Background of the Planning Area

Many stands in the planning area have had previous treatments to improve forest health, modify species composition, and create stands more resilient to wildfire. Treatments have included thinning and some regeneration cuts that have enabled planting of ponderosa pine, western larch, and western white pine. The stands targeted for treatment in the planning area are those that have not received

prior treatments although they are in previously entered areas., and are those that still require density reduction to achieve forest health goals and provide for more fire resilience.

The planning area is adjacent to several high-value landscapes, including the Mount Emily Recreation Area (map 1). It is primarily along the ridge of federal land south of Mt. Emily. Elevations range from about 5700 ft. in the eastern portions to 3900 ft. in the western portions of the management area. Some residences and private inholdings are interspersed near and within the project area. Approximately 500 acres will receive commercial treatments of thinning from below and improvement harvests. These treatments will also remove ladder fuels that could facilitate the movement of ground fires into tree crowns. Most treatments will be targeted to go to or below the lower limit of the management zone density to reduce inter-tree competition. Species composition will be improved to include more early seral, fire tolerant species. Most units will include grapple or hand piling of slash with subsequent burning, which in addition to reducing ground fuels has the added benefit of providing sites suitable for natural reproduction of larch.

One objective is to create strategic fuel breaks near open roads and ridgetops. Another is to improve the health of stands by reducing stocking, increasing the proportion of early seral species, and reducing the impact of diseases and potential for impact by forest insects.

My analysis of FSVeg data for stands proposed for management shows that about 15% have existing vegetation of Douglas-fir series forests, 66% have grand fir series forests, and about 12% is in bunchgrass grasslands (maps 2 and 3). Much of the Douglas-fir series has significant amounts of ponderosa pine. The areas mapped as grand fir series have a mixture of grand fir, Douglas-fir, western larch, and planted western white pine. The mapped existing vegetation is consistent with mapped plant association groups, which consist of about 57% in cool moist upland forest, 27% in warm dry upland forest, and 11% in hot dry upland herb land which occur as grassy areas and balds within management units in the western portion of the management area (maps 4 and 5). The cool moist upland forest PAGs are capable of supporting the growth of a variety of trees, including grand fir, Douglas-fir, western larch, ponderosa pine, and western white pine. The warm dry upland forests are less suitable for grand fir and Douglas-fir, but can support healthy ponderosa pine and larch.

Previous Reports

The Blue Mountains Service Center has produced two previous reports on this area. Craig Schmitt (2004) observed stands that were mostly further north than the current management area. He also includes observations made in parts of the current management area in T2S, R38E, sections 5 and 6, and T2S, R37E, sections 1 and 12. Diseases highlighted in this report include laminated root rot, Armillaria root disease in one stand, and Indian Paint fungus in the grand fir. His recommendations were to reduce stocking, particularly of the disease-prone grand fir, favor early seral pine and larch, and make an attempt to delineate and treat root disease centers. This report also discusses insects that are or could cause damage and describes conditions that could limit the impact of these insects. There is extensive discussion of balsam wooly adelgid in subalpine fir, and damage by spruce budworm and Douglas-fir tussock moth.

Mike Johnson, entomologist at the service center, produced a comprehensive report on the current management area based on field visits in 2020. He stresses the need to reduce stocking to reduce moisture demand and reduce competition-caused mortality. This report stresses density reduction and thinning from below to limit the possible damage from defoliators and bark beetles. The biology of fir

engraver, mountain pine beetle, spruce budworm, and Douglas-fir tussock moth is presented. There is discussion of the effects of climate change and protracted drought on forest stands in the area, particularly in reference to increasing susceptibility to bark beetles.

Diseases of Concern in the Planning Area

Heterobasidion Root Disease

Heterobasidion root disease, caused by the fungus *Heterobasidion occidentale*, is common and widespread in grand fir forests in the Blue Mountains, and grand fir is highly susceptible. This disease is initiated when spores from a fruiting body (conk) land on a fresh stump top or basal wound, germinate, and grow into the stump and root system (Schmitt 2000). Adjacent trees can become colonized when live roots contact an infected root in the ground. Colonization can result in growth loss and mortality. Although common, this disease usually does not result in discernable 'root disease centers', but more often causes scattered mortality throughout a stand. In one study in northeast Oregon, about 90% of true fir stumps were found to be colonized by *H. occidentale* (= *H. annosum*) 5-9 years after cutting, and the fungus was found at the stump surface of about 30% of natural regeneration when it was sampled. Although infection rate was high, mortality was very low (about 1%) in regeneration surrounding infected stumps. Engelmann spruce, Douglas-fir, and western larch were tolerant of infection and rarely died (Filip et. al 2000, Filip et al. 2006). Heterobasidion root disease occurs in ponderosa pine, but the fungus responsible is a different species (*H. irregulare*) than the species infecting fir, and is unlikely to be present in these stands.

Detecting the disease in a stand can be done by identifying the causal fungus in individual stumps and dead trees, and by observing the disease pattern on the landscape. In stands with a large true fir component, the disease, although often present, rarely forms discernable root disease pockets. Rather, the disease may kill a few trees, from seedling size to mature, without forming a large unstocked disease center. Although many trees may have a few infected roots, the disease often does not move to the root collar and cause mortality. Infected live trees will have signs of stress, such as reduced terminal and lateral growth, thinning crowns, yellowing foliage, or stress cones. The disease can often be found on these symptomatic trees by cutting into the center of roots to detect the brown stain; extensive decay of live trees in unlikely. Bark beetles may kill infected trees before above ground symptoms are apparent. Small trees can be pulled from the ground and often small 'popcorn' conks can be found on the roots of these infected trees. Infected roots may have a whitish to greyish mycelium on the outside of the bark. The presence of conks in stumps does not mean active disease will be found, it simply indicates there is inoculum on site.

The de-laminated decay, white pocket rot, and brown stain of incipient decay can also be observed with another root disease, laminated root rot, caused by *Coniferiporia sulphurascens*. One of the diagnostic distinctions between these two fungi is *P. sulphurascens* has setal hyphae, or short red fungal hairs, present within the decay, but these setal hyphae are never found with *Heterobasidion* spp. Another less used diagnostic distinction is that *C. sulphurascens* often has decay with pits on both sides of a delaminated sheet, while decay from *Heterobasidion spp.* have pits more prominent on one side of a delaminated sheet.

Management of Heterobasidion root disease hinges on two principles: 1- reduce or eliminate highly susceptible hosts and 2- reduce the number of receptive infection courts. When managing stands infected with *H. occidentale*, the first principle is usually achieved by favoring other species over true fir

(grand fir or subalpine fir) in prescriptions. Grand fir is the most susceptible host to *H. occidentale* in the Blue Mountains, and other species are minimally affected, although occasional mortality of Douglas-fir can occur. If Heterobasidion root disease is already present in the stand, then removing grand fir will reduce on-going mortality and remove this highly susceptible host. Thinning in impacted grand fir dominated stands is not recommended, as many susceptible trees will already be infected, and there is no evidence that the "increased vigor" from thinning decreases mortality rates. Rather, management should emphasize promotion and maintenance of early seral species.

The second principle of reducing the number of available infection courts takes two forms. The fungus naturally infects through small wounds, so designating skid trails and avoiding wounding crop trees will eliminate some infection courts. Fresh stump surfaces provide excellent infection courts. The fungus often colonizes fresh stump surfaces and then grows down through the root system, and can subsequently cause mortality when roots of live trees contact infected roots. Treating the stump tops with a borax solution prevents spores that land from successfully colonizing the stump. "Sporax", a granular borate product from Wilbur-Ellis, is registered for stump treatment, but is no longer being manufactured, although it is permissible to use any supplies that remain. The currently registered product for stump treatment is "Cellu-treat", manufactured by Nisus Corporation (https://store.nisuscorp.com/product/cellu-treat-wood-preservative-25-lb-bucket/). Cellu-treat is applied as a liquid formulation. One pound mixed with 2 gallons of water can treat up to 370 14" diameter stumps. At this rate of application, the cost of the chemical is about 1 cent per stump. If more than about 25% of stumps already show decay or conks, the disease is probably already widespread and stump treatment is not recommended.

Laminated Root Rot

Laminated root rot is caused by the fungus *Coniferiporia sulphurascens* (formerly called *Phellinus sulphurascens* or *Phellinus weirii*). In the Blue Mountains it is more likely to cause discernable root disease centers than Heterobasidion root disease. It can be detected by noting unstocked areas in a stand that often contain standing dead trees and windthrown trees with few attached roots. Similarly to Heterobasidion, infected live trees will have signs of stress, such as reduced terminal and lateral growth, thinning crowns, yellowing foliage, and stress cone crops. The disease spreads through root contacts between trees, and spread by spores is uncommon. Sporophores, which are appressed sheets of reddish mycelium with pores, are uncommon. The decay is a white pocket rot with de-laminated sheets corresponding to annual growth rings, usually with pits on both sides of the sheet. The decay is similar to that caused by Heterobasidion root disease, but setal hyphae (short red fungal hairs that can be seen with a hand lens) are usually present within the decay. Decayed roots often have a whitish mantle of mycelium outside the bark. Limiting the damage caused by laminated root rot involves favoring or planting tolerant tree species, such as ponderosa pine and larch. It is considered a 'disease of the site' because the disease can persist in infected root systems for many years, and subsequently infect susceptible reproduction (Nelson et al. 1981).

Indian Paint Fungus

Indian Paint fungus conks (*Echinodontium tinctorum*) were found in some grand fir in the management area, and previous reports note that conks are occasionally present. Indian Paint Fungus should be suspected, particularly in the moister grand fir plant associations. The fungus causes a red-brown stringy decay in the heartwood of infected trees (Filip et al. 2009). The presence of the decay can be detected by observing conks (shelf-like fruiting bodies) on the boles of trees, often just under a branch

stub. The more conks present on a tree, the more extensive the decay is likely to be. If conks are present, there is likely to be widespread infection in the stand, and many heart-rotted trees will not yet be forming conks. Regeneration in stands that have Indian Paint Fungus should be considered infected, as infection can take place quite early in the life of a tree through small branch stubs. One *E. tinctorum* conk can be associated with a decay column up to about 35 feet long. Decay by this fungus is often a large cull factor in grand fir stands. Decayed trees that must remain will serve as high quality, if short-lived, wildlife trees.

Management of Indian paint fungus can involve:
- minimize host abundance by removing grand fir in thinnings and harvests
- do not use advanced regeneration of grand fir for a succeeding stand, as these are usually already infected by the heart-rot fungi.
- minimize wounding during operations. Wounding can 'activate' pre-existing infections, and cause the rate of decay to increase in these trees.
- plan to carry grand fir crop trees for a maximum of 60-80 years. Decay takes time to progress, young trees will not have as much loss due to decay, and the amount of decay may be minimal and acceptable, especially if wounding is avoided during non-commercial thinning.

White Pine Blister Rust

White pine blister rust is a non-native disease of five-needle pines caused by the fungus C*ronartium ribicola.* Infection causes sunken or roughened cankers that can girdle and kill stems and branches. Cankers may produce a mass of yellow or orange spores in the spring, or cause areas of roughened bark that can persist for many years. Levels of infection in some of the planted stands in the Mt. Emily are moderate. The spores produced on pine infect an alternate host, most often *Ribes* species, but sometimes *Pedicularis* (lousewort) or *Castellaja* (Indian paintbrush). The spores produced on these alternate hosts infect five-needle pines. Control of blister rust relys on finding and propagating pines that are resistant to the disease. Disease resistance is confirmed by growing and then inoculating pines from the seed of trees that show little infection in the field, to confirm they are genetically resistant. Some measure of control can also be achieved by pruning branches from the lower bole of existing white pines. Many infections occur close to the ground, and pruning can remove these more-susceptible branches before they become infected. Branch infections within about 8-12 inches from the bole are likely to expand until they eventually infect the bole itself, and removing infected branches prevents these bole infections. Trees that already have an infection on the main bole are likely to die (Miller et al. 1959).

Dwarf Mistletoe

Dwarf mistletoes are flowering plants that live by parasitizing another plant. Mistletoes tap in to the water and nutrient transporting system of trees and use some of these resources for their own growth. They often cause a host response called 'brooming', which is an unusual proliferation of meristems, and looks like a bunch of twigs or branches clustered together. There often is also a swelling at the site of mistletoe infection. (Hawksworth and Weins 1996). Dwarf mistletoes are usually specific in regard to which tree species they infect and parasitize. Most dwarf mistletoe species can only infect one species of host tree. Dwarf mistletoe seeds are forcefully discharged from a seed capsule, and can be projected up to 40 to 50 feet from the source plant, although most seeds are intercepted by source host foliage or fall nearer to the source (Hawksworth 1961). Although it is difficult to manage dwarf mistletoes in un-even aged stands, trees do not suffer significant growth loss until dwarf mistletoe ratings (DMR) exceed

2. The dwarf mistletoe rating of a tree is determined by dividing the crown into thirds, and estimating the proportion of branches within that crown third that are infected by dwarf mistletoe. If there is no mistletoe, it gets a rating of 0, if less than half the branches are infected the rating is 1, and if more than half are infected the rating is 2. The ratings for the crown thirds are then added, resulting in a rating between 0 if no infection is present to 6 if all crown thirds have more than half of the branches infected (Hawksworth 1977).

Dwarf mistletoe management often involves cutting infested trees to remove the seed source of the parasite and to prevent infestation of regeneration. Management can also involve favoring non-host trees around infested trees that will be retained for wildlife or other values. Regeneration harvests have the advantage of removing all infested trees and 'sanitizing' the stand to allow growth of un-infested regeneration. Any treatment that leaves some level of infestation runs the risk of perpetuating dwarf mistletoe in succeeding stands of susceptible species.

Notes on Individual Stands Visited

<u>Eastern portion of management area</u>

In stand 59 along the 3120 road I noted abundant larch dwarf mistletoe in the overstory with a stand DMR about 4 in a previously entered stand (waypoint 78). Larch reproduction was abundant, but was only lightly infected. The amount of mistletoe currently present in the reproduction is not severe enough to cause growth loss, but brooms will develop in the future that could exacerbate fire behavior. No mitigation is suggested at this time. Further north in the same stand a few understory grand fir had been killed by Laminated Root Rot (waypoint 79). The disease was only killing a few trees, no large root disease center was found, and other species in the stand should be able to tolerate the small amount of disease present.

In stand 60 I noted some larch defoliation caused by the insect larch casebearer (waypoint 83). The insect was present on most understory seedling to sapling sized trees. This insect mines individual needles and causes them to dry and fall prematurely, as well as removing their photosynthetic capacity. In most instances damage is only present for 1 or 2 years, and does not cause significant growth loss. This level of infestation is not a management concern at this time. This was a mixed conifer stand with trees up to about 9" DBH, and I suggest removing grand fir and Engelmann spruce and promoting the larch.

In stand 62 I noted a pocket of 6 small dead grand fir (waypoint 132). These trees had been killed by Heterobasidion root disease, which was identified by the characteristic decay with pits mostly on one side of the delaminated sheets. This disease is common in grand fir in the Mt. Emily area, and the most effective treatment is to favor a species other than grand fir.

In stand 62 I found white pine blister rust in a stand of 9" to 11" DBH planted white pine about 30 years old (waypoint 80 and 126). I did not conduct an extensive survey, but the disease was present on about 1/3 of the 18 trees I examined, with many infections present in the boles. Mortality of these trees with bole infections has not yet occurred, but can be expected. If a survey shows many branch infections that have not yet reached the bole, this stand could be pruned to preclude mortality in the future. Other stands with planted western white pine that could be surveyed and treated in a similar manner are stands 63, 66, 67, and 68. Unit 66 (waypoint 128) was a seed tree cut with a few larch retained in about 1967. White pine and larch had been planted, and there was some spruce and subalpine fir

encroachment. Because it had been burned, there was abundant *Ceanothus* in some parts of the stand. There was very little blister rust in stand 66 (about 20% of the 11 trees examined). The white pine in unit 68 (waypoint 127) was younger than that in unit 62, and blister rust infection was minimal.

Western portion of management area

Unit 44 was a previously entered stand in a grand fir/pinegrass plant association (waypoint 117). Grand fir reproduction was covering about 10% of the area. A small Heterobasidion root disease center was present at waypoint 118 killing grand fir. Favoring species other than grand fir is the best way to limit mortality caused by this disease. The management proposed includes bringing basal area down to about 80ft^2/acre in stands like this, which would enable the elimination of most grand fir and the retention of other species more tolerant of Heterobasidion.

Further north along the 3800-035 road I noted abundant Douglas-fir dwarf mistletoe. This mistletoe causes large brooms in mature trees, and if these brooms are near the ground they can provide fuel ladders that can carry surface fires into the crowns. Understory Douglas-fir under infected overstory are likely to be infected but not producing noticeable brooms, so I recommend against managing advanced regeneration in infested stands, and instead favoring other species such as ponderosa pine.

Unit 53 contained many healthy ponderosa, and Douglas-fir with moderate to severe dwarf mistletoe (waypoint 119). The unit also contained some mature and understory grand fir. The mistletoe infections in the Douglas-fir were widespread, and I recommend against attempting to manage Douglas-fir in this area, favoring ponderosa pine, and removing most grand fir. In an adjacent stand to the west that is not part of a proposed management unit I found that most of the grand fir displayed conks of Indian Paint fungus (waypoint 120). This heartrot causes a large decay column, and the presence of this fungus and the defect it causes is another reason to remove as much grand fir as possible. The Douglas-fir present had dwarf mistletoe with a stand rating of about DMR 3.

I noted a Laminated Root Rot pocket that was killing 8” to 24” DBH Douglas-fir just east of unit 20 (waypoint 122). Just north of this location I observed Armillaria root disease that had killed an 8” Douglas-fir (waypoint 125). Removing Douglas-fir and grand fir from stands like this, and favoring the disease-tolerant ponderosa pine, would limit mortality from these diseases.

Further west along Three Cabin Ridge we conducted reconnaissance in unit 2 (waypoint 123). The stand is dry ponderosa pine that had already had a commercial thin. I noted no disease problems in this stand, but density is still a little high considering the dryness of the site, and I recommend further density reduction. There were a few Douglas-fir with DMR 3-5, and these should be removed during operations. There were several larch with some larch reproduction in the skid trails. Ground disturbance and burning, and creating some openings, would allow further reproduction of this species for stand diversity. Further down the slope adjacent to unit 5 there were grand fir greater than 21” DBH that had Indian Paint conks. There are sufficient ponderosa pine in these stands to allow removal of the grand fir while still maintaining an appropriately stocked stand.

Michael McWilliams
Forest Pathologist

Cc: Bill Gamble, Lucas Glick, James Brammer, Mike Johnson, Lia Spiegel

Waypoints mentioned in the text:

waypoint	lat	long
78	45.40632	-118.12845
79	45.40777	-118.12927
80	45.41435	-118.12633
83	45.41114	-118.12921
117	45.40385	-118.15170
118	45.40310	-118.15030
119	45.41221	-118.15784
120	45.41273	-118.15884
121	45.41274	-118.15881
122	45.40275	-118.19161
123	45.38970	-118.21225
124	45.39136	-118.21479
125	45.40395	-118.19298
126	45.41515	-118.12554
127	45.42706	-118.11603
128	45.42745	-118.10567
132	45.41839	-118.12592

References

GIS data for vegetation analysis:
T:\FS\Reference\GIS\r06_waw\LayerFile\Vegetation

GIS data for project area:
T:\FS\NFS\WallowaWhitman\Project\lagFivePointsFuelsReduction2020\GIS\Data

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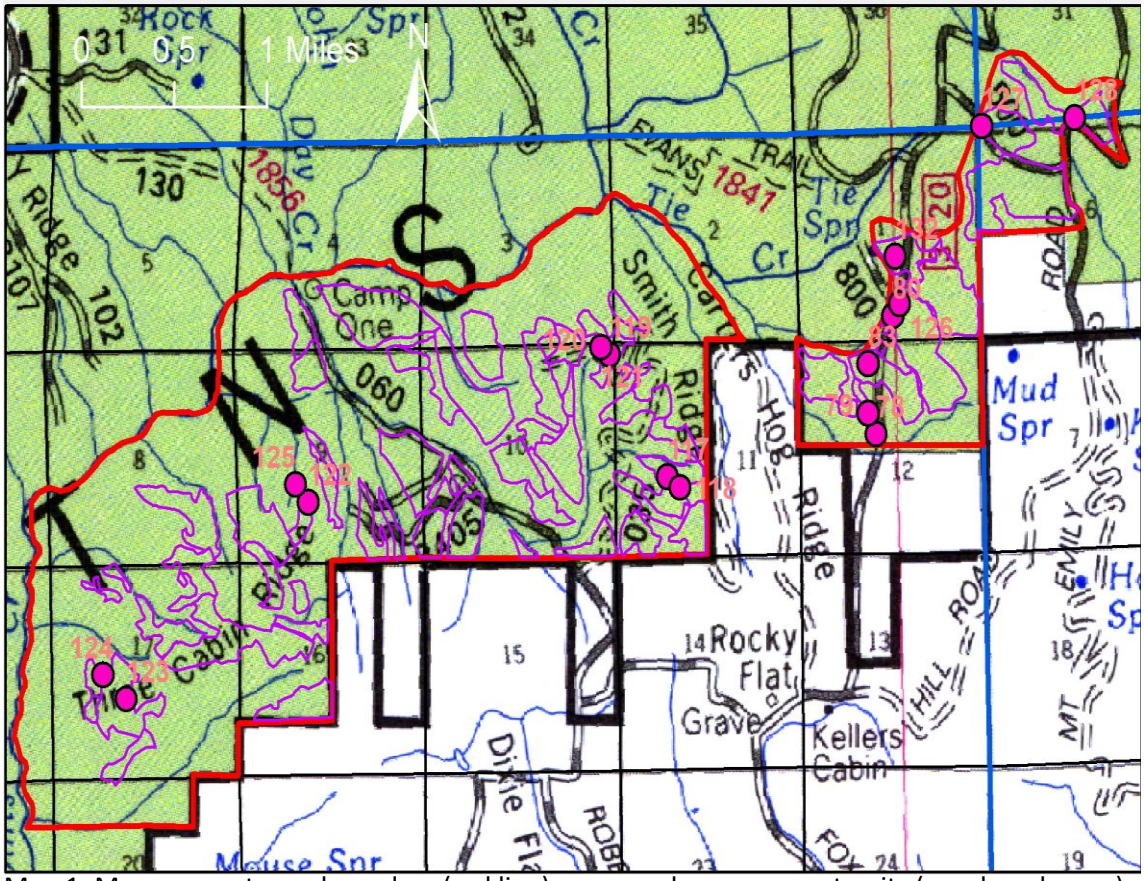
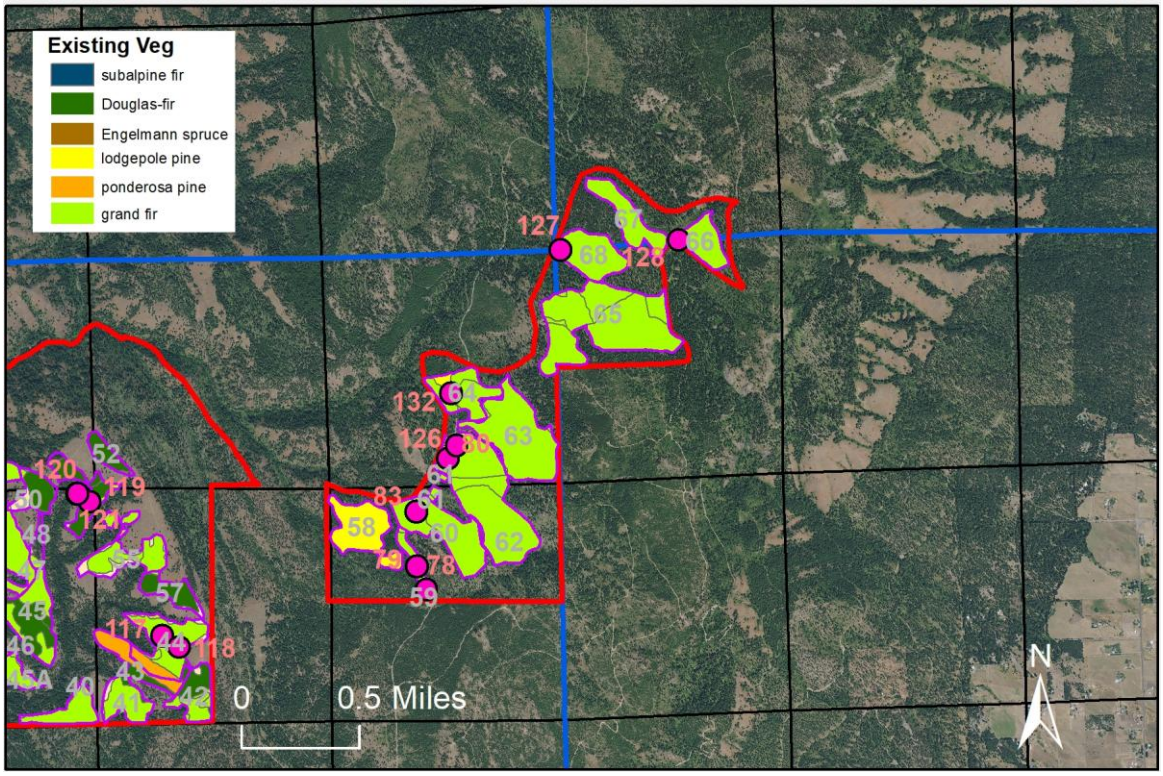
(link: < https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_043457.pdf>)

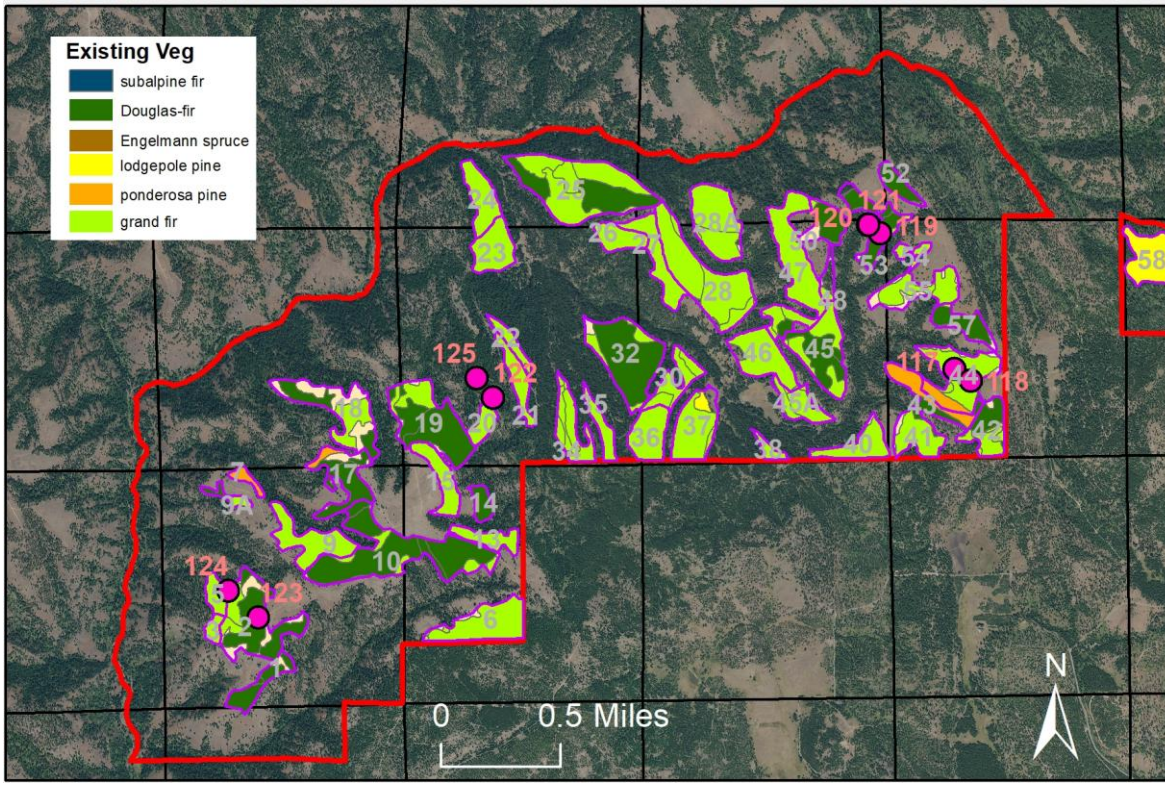
Maps of the management area



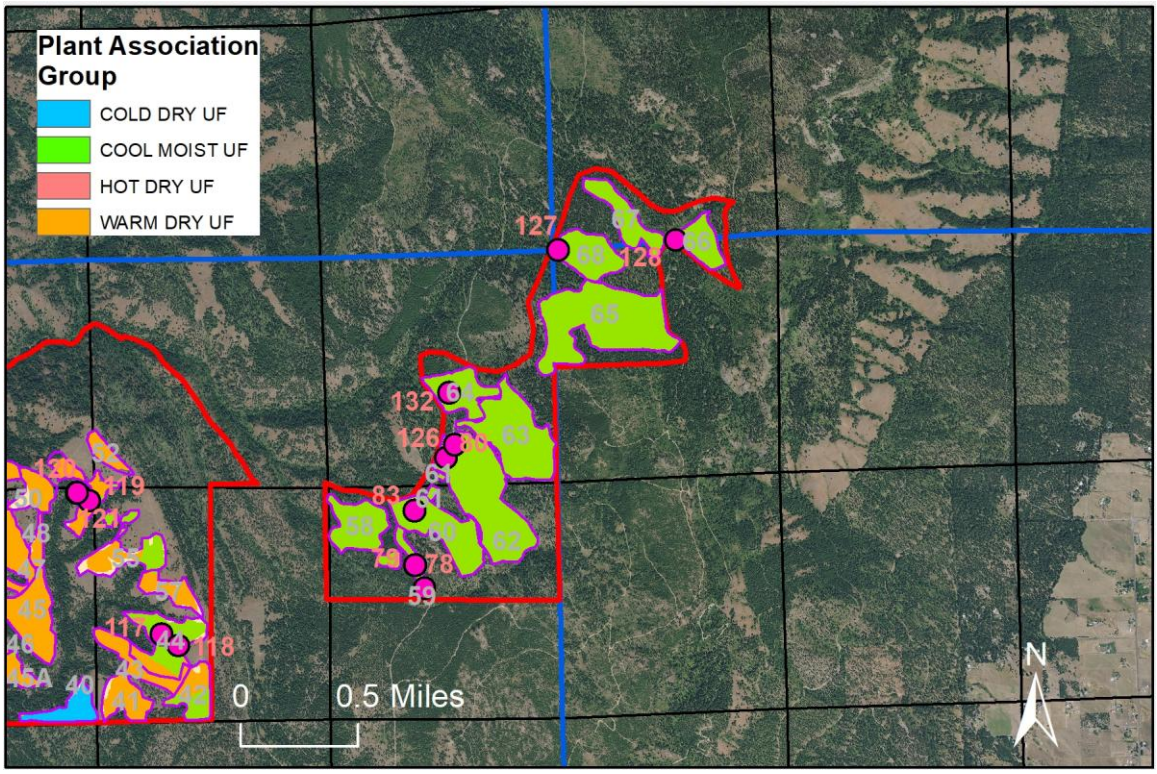
Map 1: Management area boundary (red line), proposed management units (purple polygons) and waypoints referenced in the text (pink dots).



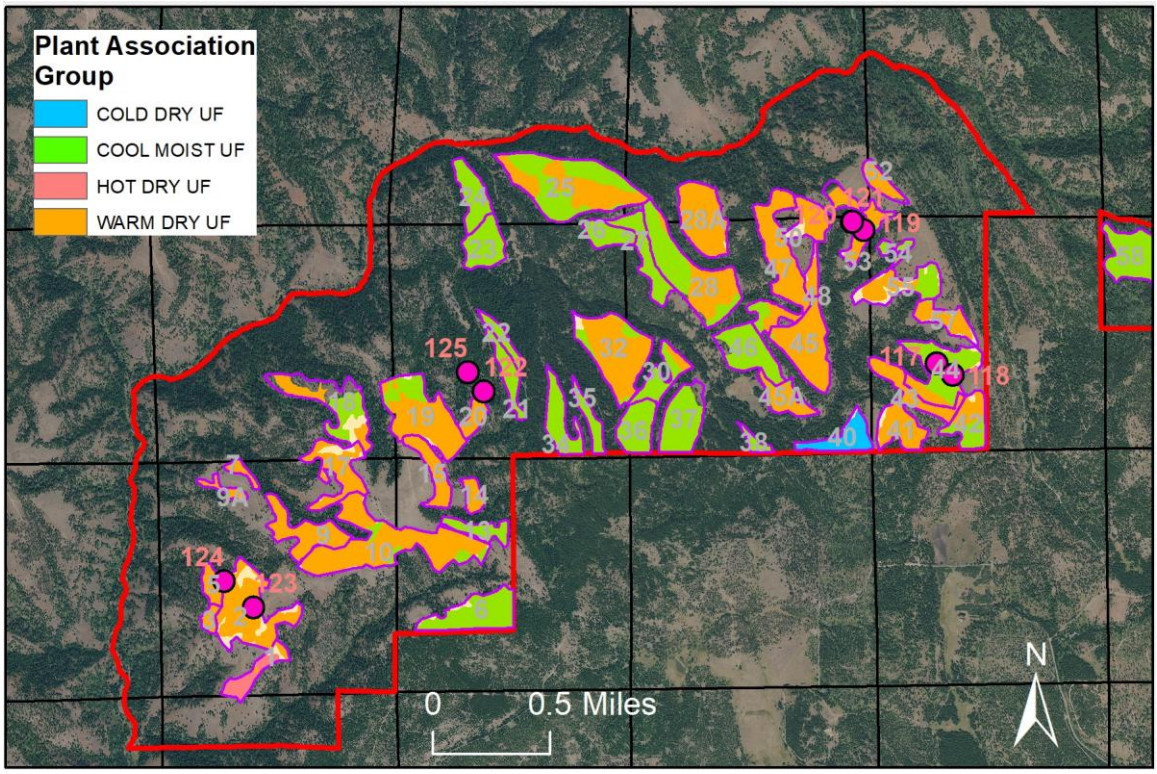
Map 2: Existing vegetation in the eastern portion of the management area.



Map 3: Existing vegetation in the western portion of the management area



Map 4: Plant association groups in the eastern portion of the management area.



Map 5: Plant association groups in the western portion of the management area.